

**WILLI WILLI CAVES NATURE RESERVE
PLAN OF MANAGEMENT**

NSW National Parks and Wildlife Service

Part of the Department of Environment and Conservation (NSW)

May 2004

This plan of management was adopted by the Minister for the Environment on 18 May 2004.

Acknowledgments

This plan of management was prepared by NPWS Macleay Area staff, NPWS Mid-North Coast Regional staff and the NPWS Northern Directorate Planning Group.

Further information

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ISBN 0 7313 6593 3

FOREWORD

Willi Willi Caves Nature Reserve covers 8ha and is located on the Mid North Coast of NSW on the lower slope of a ridge in the upper Macleay River catchment, 35 km to the west of Kempsey.

Willi Willi Caves Nature Reserve protects part of a limestone karst system. The Australian Speleological Federation (ASF 1985) lists some 37 entrances in the reserve with the Willi Willi Bat Cave being the main feature. This cave is basically one large chamber with a number of branching tunnels connected to it and is used as a maternity cave by bats.

The reserve also contains approximately 2ha of dry lowland rainforest. Much of the dry rainforest occurs on limestone and represents one of the few occurrences of rainforest on limestone in NSW. The rainforest contains a small population of the small-leafed laurel (*Cryptocarya williwilliana*), a rare endemic to the Macleay Valley.

The *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document that outlines how the area will be managed in the years ahead. The procedures for the adoption of a plan of management for a nature reserve are specified in the Act.

A draft plan of management for Willi Willi Caves Nature Reserve was placed on public exhibition for four months from 13th December 2002 until 28th March 2003. The exhibition of the plan of management attracted 2 submissions which raised 4 issues. All submissions received were carefully considered before adopting this plan of management.

This plan of management aims to protect the biodiversity of the nature reserve, and in particular protect the karst features, preserve the bat maternity site, and preserve the dry rainforest community.

This plan of management establishes the scheme of operations for Willi Willi Caves Nature Reserve. In accordance with section 76 of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted.

BOB DEBUS
MINISTER FOR THE ENVIRONMENT

1. NATURE RESERVES IN NEW SOUTH WALES

1.1 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). Section 72AA of the NPW Act lists the matters to be considered in the preparation of a plan of management. The policies arise from the legislative background and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, commercial use, research and communication.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) requires the assessment and mitigation of environmental impacts of any works proposed in this plan.

1.2 IUCN GUIDELINES FOR CAVE AND KARST PROTECTION

The International Union for Conservation of Nature and Natural Resources (IUCN), also known as the World Conservation Union, is an inter-governmental agency of which Australia is a member. IUCN seeks to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

In 1997 the World Commission on Protected Areas, a commission of the IUCN, produced Guidelines for Cave and Karst Protection (Watson et al., 1997). These guidelines were developed to increase awareness of cave and karst protection issues and the special management considerations essential for the protection of cave and karst areas. They were designed to provide a guide for planners, managers and users of karst systems. This plan of management is based on the IUCN guidelines, although not all are specifically mentioned and some strategies have been modified where appropriate to better apply to the management of the reserve.

1.3 MANAGEMENT OBJECTIVES

Nature reserves are reserved under the NPW Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

Under the Act, nature reserves are managed to:

- conserve biodiversity, maintain ecosystem functions, and protect geological and geomorphological features and natural phenomena;

- conserve places, objects, features and landscapes of cultural value;
- promote public appreciation, enjoyment and understanding of the reserve's natural and cultural values; and
- provide for appropriate research and monitoring.

Nature reserves differ from national parks in that they do not have as a management principle to provide for visitor use.

The following specific objectives also apply to the management of Willi Willi Caves Nature Reserve:

- preservation of the Bat Cave as a bat maternity cave,
- preservation of karst features and;
- preservation of the dry rainforest community.

2. WILLI WILLI CAVES NATURE RESERVE — BASIS FOR MANAGEMENT

This plan applies both to the land currently reserved as Willi Willi Caves Nature Reserve and to any future additions to the reserve. Where management strategies or works are proposed for the reserve or any additions that are not consistent with the plan, an amendment to the plan will be required.

2.1 LOCATION, GAZETTAL AND REGIONAL SETTING

Willi Willi Caves Nature Reserve (hereafter called “the reserve”) was gazetted on 6 April 1973 and covers an area of 8.09 ha. The reserve is located on the Mid North Coast of NSW on the lower slope of a ridge in the upper Macleay River catchment, 35 km to the west of Kempsey. Willi Willi is believed to mean “many possums” in the local Aboriginal language (Reed 1982).

The reserve protects part of a limestone karst system and contains at least one cave that is used as a maternity cave by bats. The reserve also contains approximately 2.2 ha of dry lowland rainforest (Floyd 1983). The reserve has been identified as part of the Werrikimbe Wilderness, but at this stage there is no proposal to declare the reserve as wilderness.

Most of the surrounding land is uncleared private leaseholding, valued for its water yield and catchment protection, although timber has been sporadically removed for fencing and other farm needs. Mt Sebastapol, located 2 km to the east, is a reserve for public recreation, which contains both karst and rainforest. The southern boundary of Willi Willi Caves Nature Reserve adjoins land acquired and managed by NPWS, which is proposed as an addition to Willi Willi National Park. Grazing and occasional cropping occurs on cleared land approximately 2 km north of the reserve.

The reserve is within the Kempsey Local Aboriginal Land Council area, the Mid North Coast Catchment Management Board area, the Kempsey Rural Lands Protection Board and the Kempsey Local Government Area.

2.2 LANDSCAPE CONTEXT

Natural and cultural heritage and on-going use are strongly inter-related and together form the landscape of an area. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land use practices and the activities of modern day Australians continue to influence bushland through recreational use, cultural practices, the presence of introduced plants and animals and in some cases air and water pollution.

The geology, landform, climate and plant and animal communities of the area, plus its location, have determined how it has been used by humans. In the past Willi Willi Bat Cave was mined for bat guano, however the importance of the karst system that provides important habitat for threatened bat species led to protection by gazettal of the reserve. Members of speleological organisations who have visited the caves contributed greatly to knowledge of the cave system in the reserve.

Both Aboriginal and non-Aboriginal people place cultural values on natural areas, including aesthetic, social, spiritual, recreational and other values. Cultural values may be attached to the landscape as a whole or to individual components, for example to plant and animal species used by Aboriginal people. This plan of management aims to conserve both natural and cultural values. For reasons of clarity and document usefulness natural and cultural heritage, non-human threats and on-going use are dealt with individually, but their inter-relationships are recognised.

2.3 NATURAL AND CULTURAL HERITAGE

Landform, Geology, Karst and Soils

The reserve lies on the saddle between Mount Pleasant and a prominent ridge running south to a peak called Jacobs Ladder. It includes a folded and faulted Permian/Carboniferous limestone stratum. This limestone stratum runs from near Kundabung to the upper Kunderang Brook and includes the karst areas of Yessabah Nature Reserve, The Castles Nature Reserve, Crystal Hill, Moparrabah as well as those within Willi Willi Caves Nature Reserve and the nearby Mt Sebastapol Reserve for Public Recreation (see the map).

The caves within the reserve were formed either beneath the water table or in a fluctuating water table, which indicates a great age for the caves, now high in the landscape (NPWS 1994). The limestone formation consists of massive limestone almost entirely composed of fern-like corals (Northcott 1973), interbedded with well-sorted calcium carbonate rich sands, shales and conglomerates.

The Australian Speleological Federation (ASF 1985) lists some 37 entrances in the reserve with the Willi Willi Bat Cave being the main feature. This cave is basically one large chamber with a number of branching tunnels connected to it. The entrance of this cave lies directly under the crest of a small fold about 10m across and the main chamber is developed along the axis of this small anticlinal fold plunging to the east. The branching tunnels trend at angles of 90° to the main chamber and 30° to each other, having formed by dissolution of limestone along the prominent joint planes. The central chamber of the cave is 33 m long, varying in width from 10 m to 13 m. The average height of the roof is 8.2 m, rising to a maximum of 12.8 m (Wallis 1965).

The reserve is on the boundary of the Nambucca geological block. The non-limestone areas of the reserve are part of the Parrabel beds which are chiefly lithic sandstones and siltstones (Northcott 1973).

The soils are highly variable, as indicated by the complex geology. The majority of the reserve has shallow, poor, stony soils, apart from those areas enriched by materials high in mineral nutrients. These mineral rich materials are alluvial deposits derived from less soluble weathered limestone and later included within the younger geology of the reserve (Floyd 1983).

Catchment values

The small size of the reserve means that little water is drained from the area of the reserve. Water that does leave the reserve flows to Warbro Brook and is used for domestic stock watering. Warbro Brook enters the Macleay River above Toorooka. Domestic water for the town of Kempsey is drawn from the Macleay River.

Native Plants

The reserve contains an area of dry rainforest dominated by yellow tulipwood (*Drypetes australasica*) and shatterwood (*Backhousia sciadophora*). Much of the dry rainforest occurs on limestone and represents one of the few occurrences of rainforest on limestone in NSW (Floyd 1983). One of the unusual species in the rainforest is the small-leaved laurel (*Cryptocarya williwillieana*). This species is listed as a Rare or Threatened Australian Plant (ROTAP) (Briggs & Leigh 1995) and is known only from this limestone belt.

A survey of vegetation was carried out in the rainforest area of the reserve by Floyd in 1983. This survey found the small-leaved laurel, together with thirty other rainforest tree species, nine shrub species, four vines, four herbs and six epiphytes.

The remainder of the reserve, chiefly on the western aspect, appears to have been subjected to intense wildfires and has reverted to lantana (*Lantana camara*) shrubland.

Native Animals

Five significant vertebrate animal species are known to occur in the reserve, including two species listed as vulnerable under the TSC Act (see table 1).

Table 1 Significant vertebrate species recorded in the reserve

Common name	Scientific name	Status under the TSC Act or other significance
Mammals		
little bent-wing bat	<i>Miniopterus australis</i>	Vulnerable
large bent-wing bat	<i>Miniopterus schreibersii</i>	Vulnerable
eastern horseshoe bat	<i>Rhinolophus megaphyllus</i>	Regionally significant
Birds		
pale-yellow robin	<i>Tregellasia capito</i>	Regionally significant
Reptiles		
a burrowing skink	<i>Ophioscincus truncatus</i>	Regionally significant
—	<i>Saltuarius swaini</i>	Regionally significant

The Willi Willi Bat Cave is used as a maternity cave by the little bent-wing bat, the large bent-wing bat and the eastern horseshoe bat (Dwyer 1963, 1966, 1968; Dwyer and Hamilton-Smith 1965). It must be regarded as one of the most important bat caves in NSW as a result of the species mix, especially as it is the maternity site for two, apparently disjunct, populations of little bent-wing bats (Dwyer 1968). Dwyer describes a highland and lowland group of the one species, with very little interchange between them in spite of their joint use of the cave. He believes that the

lack of interbreeding is part of the evolution of this species and that Willi Willi Caves is important in demonstrating this behaviour.

The invertebrate fauna of the reserve is likely to be significant. Eberhard and Spate (1995) collected 28 specimens, most of which are yet to be determined taxonomically. Some of these may be new species.

The reserve was modelled during the comprehensive regional assessment (CRA) process as providing suitable habitat for five other significant species, including four listed as vulnerable and one listed as endangered on the TSC Act (Table 2).

Table 2 Significant species predicted to occur within the reserve

Common name	Scientific name	Status under the TSC Act
Mammals		
eastern pygmy-possum	<i>Cercartetus nanus</i>	Vulnerable
brush-tailed phascogale	<i>Phascogale tapoatafa</i>	Vulnerable
golden-tipped bat	<i>Kerivoula papuensis</i>	Vulnerable
Amphibians		
sphagnum frog	<i>Philoria sphagnicolus</i>	Vulnerable
giant barred frog	<i>Mixophyes iteratus</i>	Endangered [^]

[^] also listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999*

The area surrounding the reserve is part of the Crystal Hill regional fauna corridor which is the link between the Boonanghi-Collombatti and the Mt Mystery corridors. The Mount Mystery corridor links with regional fauna corridors to the west.

NPWS is required by the TSC Act to prepare and implement recovery plans for all listed threatened species. These are progressively being prepared and will be used to guide management of threatened species in the area.

Aboriginal Heritage

Aboriginal communities have an association and connection to the land. The land and water biodiversity values within a whole landscape context are the centre of Aboriginal spirituality and contribute to Aboriginal peoples identity. Aboriginal communities associate natural resources with the use and enjoyment of valued foods and medicines, caring for the land, passing on cultural knowledge and strengthening social bonds. Aboriginal heritage and nature are inseparable from each other and need to be managed in an integrated manner across the landscape.

The reserve is within the Dughutti tribal area and the Kempsey Local Aboriginal Land Council area. No Aboriginal sites have been found within the reserve, however, no systematic studies for these sites have been undertaken.

Non-Aboriginal Heritage

The Willi Willi Bat Cave was mined for guano in the 1920s, when some 90 tonnes was removed. The guano was extracted by means of a skip drawn on wooden rails. The cave was again mined for guano in the 1940's, the guano being lowered down the steep slope at the foot of the ridge by a motorised flying fox (McIver, pers. comm.). Other than some timber track remnants, there is little evidence of this activity remaining today.

2.3 THREATS TO THE RESERVE'S VALUES

Introduced plants

There has been no formal survey of weed species within the reserve, but casual observation indicates that the main body of the reserve is under threat from red lantana (*Lantana camara*). Red lantana is a noxious weed in Kempsey Shire and is present on the dry exposed western side of the reserve, as well as on the surrounding lease holdings. This weed has the potential to invade the rainforest on the eastern slopes and reduce the available foraging area for bats.

Introduced animals

Introduced animals have the potential to cause detrimental effects on ecological values of the reserve. There has been no formal survey of pest animals carried out within the reserve, however rabbits (*Oryctolagus cuniculus*) are commonly seen in the nearby cleared lands and foxes (*Vulpes vulpes*) are also likely to be present. Feral pigs (*Sus scrofa*) have been recorded to the south and west in Willi Willi, Oxley Wild Rivers and Werrikimbe National Parks, however there is no evidence of pigs in the reserve. Dingoes (*Canis lupus dingo*) and wild dogs (*Canis familiaris*) have been sighted in Willi Willi National Park as well as the nearby Carrai State Forest, and may occur in the reserve.

There are no fences separating the reserve from lease holdings and private lands surrounding the reserve however, stock from the surrounding lands do not enter the reserve, due to the steep nature of the terrain and the lack of grazing in the heavily shaded forests and lantana thickets.

Fire

There have been no fires recorded on the reserve, although the non-rainforest area of the reserve, chiefly on the western side, appears to have been subject to intense wildfire in the past. In 1997/98 and 2001/02, wildfire came very close to entering the reserve.

Fire should be excluded from the reserve because it poses a threat to the dry rainforest and cave ecology. It is also likely to promote the spread of lantana into the rainforest.

Assets which border the reserve include very steep uncleared private lands used for seasonal bush grazing around most of the reserve, with associated fencing, as well as Willi Willi National Park, to the south.

The 'NPWS Approach to Fire Management Planning' (2002) uses a system of bushfire management zones for bushfire management in NPWS reserves. These zones are compatible with the system adopted by the Bushfire Coordinating Committee for use in District Bushfire Management Committee (DBFMC) bushfire risk management plans. The approach divides reserves into fire management zones. These zones are management areas where specified fire management operational objectives, strategies and performance indicators have been developed to mitigate against the threat of a wildfire.

NPWS has assessed the reserve for fire management planning purposes and has zoned the reserve as a Heritage Area Management Zone (HAMZ). The primary fire management objectives for this zone are to prevent the extinction of any species that are known to occur naturally within the reserve, and to protect culturally significant sites. The reserve has been designated as a HAMZ because of the sensitivity of rainforest vegetation, limestone karst features, invertebrate fauna and bat communities. The HAMZ does not require intensive management and focuses on those actions appropriate to conserve biodiversity and cultural heritage including exclusion of fire from the reserve.

2.4 ACCESS

Access to the reserve is required for control of fire and other management activities. There is no vehicle access available to the reserve. There are two unconstructed road reservations, however, these alignments are impracticable for constructed access due to extremely steep slopes. The reserve is approached from Carrai Road. Access to the reserve is then by vehicle and foot across private property, subject to the owner's permission.

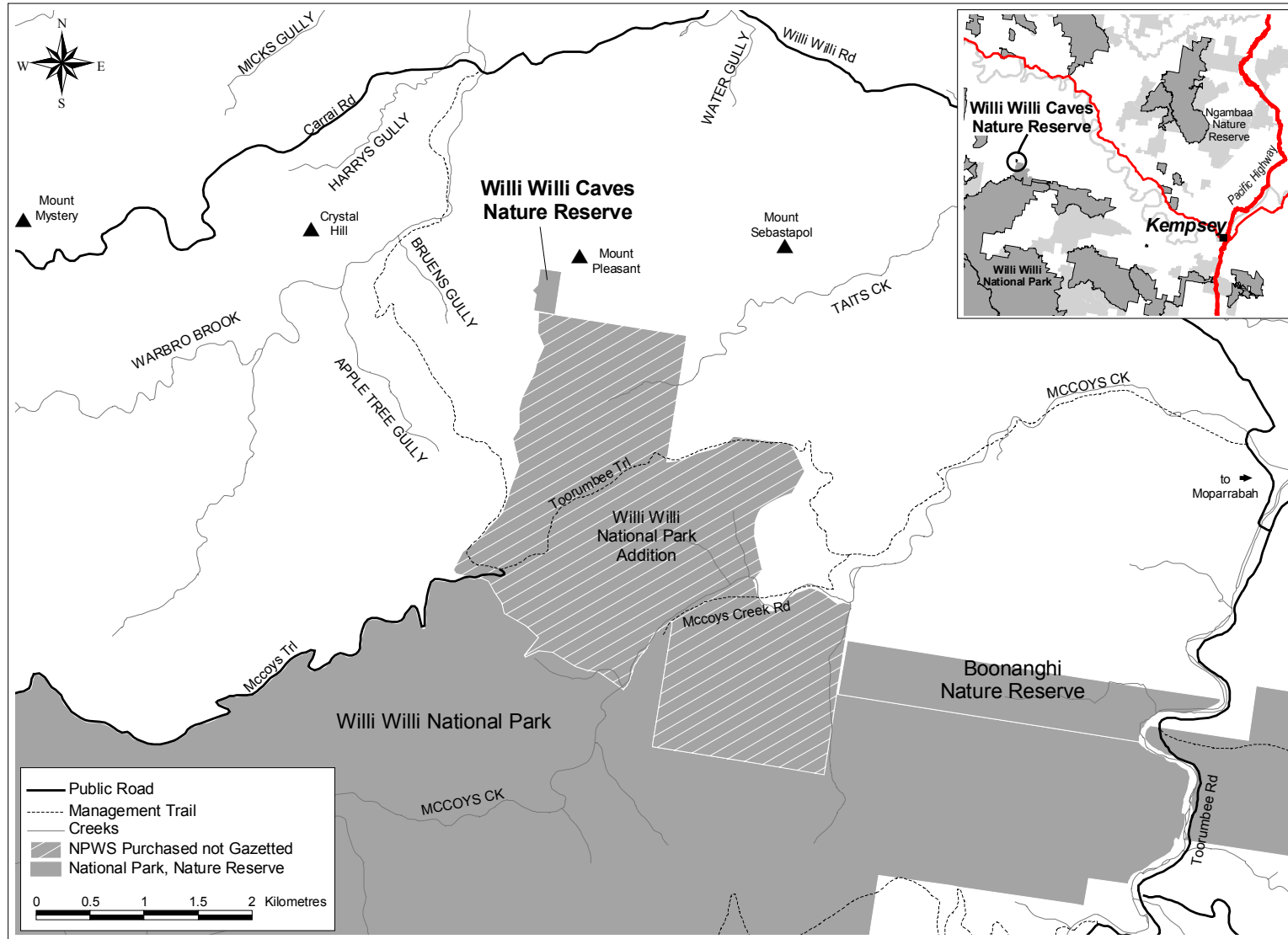
2.5 VISITOR USE

There is no history of visitor use of the reserve, other than by speleological clubs, due to the difficult access. There are no visitor facilities in the reserve and there is currently no boundary signage or other signage within the reserve.

Recreational activities not consistent with the study of nature and natural environments are generally considered inappropriate uses of a nature reserve. NPWS has not promoted general recreational use of the reserve because of concerns about visitor impacts on karst values, including bats and fossils.

Carrai State Forest, some 15 km to the south-west, provides opportunities for horse riding and recreational driving. Camping is available at the Kookaburra site within Carrai State Forest, as well as in Carrai National Park, approximately 30 km west of the reserve.

3. WILLI WILLI CAVES NATURE RESERVE AND LOCALITY MAP



4. WILLI WILLI CAVES NATURE RESERVES — MANAGEMENT ISSUES AND STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
<p>Soil and water conservation</p> <p>Although there are currently minimal soil erosion or water quality issues, the soils in the reserve are highly erodible if disturbed.</p>	<ul style="list-style-type: none"> • Soil erosion is minimised. • There is no reduction in water quality in the reserve’s surface or groundwater. 	<ul style="list-style-type: none"> • Undertake any works which have the potential to disturb the soil or pollute groundwater, such as pest control, in a manner that minimises erosion and water pollution (refer to Introduced species). 	High
<p>Karst conservation</p> <p>The karst system is important as a bat maternity site for three bat species and has an abundance of fossils within the limestone. Caves may extend beyond the reserve boundary beneath the surface.</p> <p>Other nearby karst areas include Mount Sebastapol, to the east of the reserve, is within a reserve for Public Recreation.</p>	<ul style="list-style-type: none"> • Appropriate areas of karst system outside the current reserve boundaries are added to the reserve. • Karst systems are protected from human disturbance and natural processes are allowed to continue. • External activities, such as blasting for road construction, do not adversely impact on the reserve. 	<ul style="list-style-type: none"> • Seek to have Mount Sebastapol and other nearby karst areas added to the reserve to further protect the karst system. • Restrict access to the karst system (refer to Native plant and animal conservation, Visitor use and Research) to protect karst values. • Carry out all works in the reserve to minimise impact on the karst system and seek to limit the use of explosives in the vicinity of the reserve. 	High High High

Current Situation	Desired Outcomes	Strategies	Priority
<p>Native plant and animal conservation</p> <p>The reserve is one of the most important bat caves in NSW as a result of the species mix.</p> <p>There is a need to protect the bats from disturbance during breeding and hibernation periods.</p> <p>The invertebrate fauna of the reserve is likely to be significant and may include new species. Further knowledge of threatened flora and fauna is required, to improve management of the reserve.</p> <p>Ecological modelling has identified that the reserve contains potential habitat for a number of threatened species in addition to the 5 known significant animal species.</p> <p>Dry rainforest in the reserve represents one of the few occurrences of rainforest on limestone in NSW.</p> <p>Ecological viability of the reserve would be improved by the maintenance of vegetation corridors on neighbouring lands.</p>	<ul style="list-style-type: none"> • There is no loss of native plant and animal species found in the reserve, or reduction in habitat diversity. • The ecological viability of the reserve is enhanced by retention of native vegetation in surrounding areas. • There is increased knowledge of native plant and animals in the reserve and their ecological requirements. 	<ul style="list-style-type: none"> • Access to the caves will only be permitted during April, September and October, out of breeding or hibernation periods, unless for approved scientific investigation of bats (refer to Visitor use and Research). • Work with relevant neighbours including leaseholders, Landcare groups and others to encourage retention, and if possible expansion, of vegetation in the vicinity of the reserve. • Undertake or encourage appropriate surveys of plant and animal species, in particular to determine the occurrence of significant species and their ecological requirements (refer to Research). • Exclude fire from the reserve to protect dry rainforest vegetation (refer Fire Management). • Implement recovery plans for significant species as prepared. 	<p>High</p> <p>Low</p> <p>Medium</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Introduced species</p> <p>Lantana has the potential to invade the dry rainforest community of the reserve and may threaten use of the area by bats by impeding flight.</p> <p>Pest animals such as foxes, rabbits and possibly dogs are likely to occur in the reserve.</p> <p>No formal survey has been conducted for introduced plants or animals.</p> <p>Pest animals such as foxes, rabbits and possibly dogs are likely to occur in the reserve.</p> <p>A Pest Management Strategy has been developed for the region as a whole. This strategy identifies pest populations, priorities for control and suggested control methods.</p>	<ul style="list-style-type: none"> • The impact of introduced species on native species and neighbouring lands is minimised. • Lantana distribution does not expand beyond it's current extent. • Native plant regeneration occurs in areas of severe lantana infestation. • Control of introduced species has minimal impact on native species. 	<ul style="list-style-type: none"> • Control, and where possible eradicate, introduced pest plant and animal species found in the reserve in accordance with the Regional Pest Management Strategy. Control of lantana will be a priority in the reserve. • Seek the cooperation of neighbours, the Kempsey Rural Lands Protection Board, Kempsey Shire Council, the Mid North Coast Weeds Advisory Council, and other stakeholders in implementing weed and pest animal control programs. • Undertake or encourage a survey of pest plant and animal species. • Use weed control techniques that minimise soil exposure and potential for herbicides to infiltrate into karst systems of the reserve. • Undertake works to encourage native revegetation following weed control. 	<p>Medium</p> <p>Medium</p> <p>Low</p> <p>Low</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Fire management</p> <p>Fire is a natural feature of the environment and is essential to the survival of some plant communities but can be destructive to others.</p> <p>Frequent or regular fire can cause loss of particular plant and animal species and communities. Rainforest is particularly vulnerable to fire, and likely to be compromised by lantana invasion following fire.</p> <p>Karst features and cave fauna, including bats and invertebrate fauna in the reserve are sensitive to the effects of fire.</p> <p>Fire could also damage some cultural features, as well as threaten neighbouring land.</p>	<ul style="list-style-type: none"> • Fire is excluded from the reserve. • Life and property are protected from fire. • The potential for spread of wildfire on, from, or into the reserve is restricted. • There is no reduction in the extent of dry rainforest in the reserve as a result of fire. 	<ul style="list-style-type: none"> • Cooperate with neighbours who wish to conduct hazard reduction adjacent to the reserve boundary and encourage neighbours to assist in excluding fire from the reserve by the use of strategic firebreaks during private hazard reduction. • Manage the reserve as a Heritage Area Management Zone. • Prescribed burning will not be undertaken on the reserve unless research indicates that fire is necessary to protect biodiversity values. • No trails will be established within the reserve. • Exclude fire from the reserve to protect dry rainforest communities, cultural features and karst values. • Continue to participate in the Kempsey Bush Fire Management Committee and maintain close contact and cooperation with neighbours, Council fire officers and volunteer bush fire brigades concerning fire management on and adjacent to the reserve. 	<p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Cultural heritage</p> <p>There are no known Aboriginal sites within the reserve, however no formal study has been undertaken.</p> <p>There are wooden rails associated with guano extraction remaining in the reserve. These are considered to be of historic significance.</p>	<ul style="list-style-type: none"> • Cultural heritage studies are undertaken and any objects, sites or values are appropriately recorded and protected. • Relics of the guano industry are retained in the reserve. 	<ul style="list-style-type: none"> • Undertake an archaeological survey and cultural assessment prior to all new works with the potential to impact on Aboriginal or non-Aboriginal sites and values. • Encourage appropriate research into the cultural heritage of the reserve (refer to Research). • Consult with the Dughutti elders and the Kempsey Local Aboriginal Land Council in all aspects of management of any identified Aboriginal sites, objects, places and values. Provide copies of any research findings on Aboriginal cultural heritage to the Land Council (refer to Research). • Record, and retain as far as practicable, the historic relics associated with the guano extraction industry. 	<p>High</p> <p>Medium</p> <p>High</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Visitor use</p> <p>The only practicable access to the reserve is by foot across private land.</p> <p>The karst area is easily damaged and contains a particularly important bat maternity cave as well as fossils and other features, which may be threatened by disturbance.</p> <p>There is currently a low level of visitor use of the reserve by authorised speleological clubs.</p>	<ul style="list-style-type: none"> • The local community is aware of the significance of the area and of management programs. • Visitor access does not threaten karst values. • Visitor access to the reserve is restricted to approved speleological clubs, educational visits and scientific purposes. 	<ul style="list-style-type: none"> • Liaise with neighbours and the local community to promote community understanding of the reserve's values and management strategies. • Access to the reserve by speleological groups, educational groups and scientists will require approval by NPWS and the relevant landholders. • Visitor use of the reserve will not be encouraged or promoted. No visitor facilities will be provided in the reserve, apart from signage on access restrictions. • Access to the caves will only be permitted during the months of April, September and October, when the bats are not breeding or hibernating. Impacts will be monitored and restrictions on the number of people and other conditions may be imposed. • Liaise with relevant neighbours about restricting access to the reserve through private property, during bat breeding or hibernating periods. • Access to the caves outside of these months may be permitted for management and approved scientific research purposes only (refer Research). • Cave users must be acquainted with, and abide by, the Australian Speleological Federation Incorporated (ASF) <i>Code of Ethics and Conservation, Safety Code and Minimal Impact Caving Code</i>. • Commercial and other general recreation access to the reserve will not be permitted. 	<p>Low</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Research</p> <p>Further scientific study will improve understanding of the reserve's natural and cultural heritage values and the processes that affect them.</p> <p>No formal, comprehensive flora or fauna surveys have been undertaken in the reserve, other than an invertebrate survey.</p>	<ul style="list-style-type: none"> Research that enhances scientific knowledge, which also assists management of the reserve, is undertaken. 	<ul style="list-style-type: none"> Undertake or encourage research to improve knowledge and management of natural and cultural values (refer to Native plant and animal conservation, Cultural heritage and Fire management). Only permit research that causes minimal disturbance to the natural and cultural values of the reserve. Access to the caves will not be permitted between 1 May and 31 August (hibernation period), or between 1 November and 31 March (breeding period), unless for essential scientific investigation related to bat conservation and subject to NPWS approval. Access to the caves by researchers will require approval from private landholders for access through private property. Cave users must be acquainted with, and abide by, the Australian Speleological Federation Incorporated (ASF) <i>Code of Ethics and Conservation, Safety Code and Minimal Impact Caving Code</i>. Researchers must hold appropriate qualifications and approvals from relevant organisations relating to their field of research. Require all researchers and others granted permission to access the caves to maintain a detailed and accurate information base on the caves. 	<p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p> <p>High</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Management operations</p> <p>Access to the reserve is via private land after obtaining consent from landholders or via Willi Willi National Park and recently purchased lands. There are no management trails in the reserve.</p>	<ul style="list-style-type: none"> • Suitable access is available for NPWS management purposes. • There are no management trails or facilities constructed in the reserve. 	<ul style="list-style-type: none"> • Liaise with neighbours to formalise an ongoing access agreement through private property for NPWS management purposes. 	High

Legend for priorities in management issues and strategies table above:

High priority activities are those imperative to achievement of the objectives and desired outcomes. They must be undertaken in the near future to avoid significant deterioration in natural, cultural or management resources.

Medium priority activities are those that are necessary to achieve the objectives and desired outcomes but are not urgent.

Low priority activities are desirable to achieve management objectives and desired outcomes but can wait until resources become available.

Once a plan has been adopted by the Minister it must be implemented, and no operations may be undertaken except in accordance with the plan. If after adequate investigation, operations not included in the plan are found to be justified, the plan may be amended in accordance with section 73B of the Act.

5. REFERENCES

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GLOSSARY

ACRONYMS USED

NPW Act	NSW <i>National Parks and Wildlife Act (1974)</i>
NPWS	NSW National Parks and Wildlife Service
TSC Act	NSW <i>Threatened Species Conservation Act (1995)</i>

SELECTED DEFINITIONS

Biodiversity Biological diversity, namely the variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem

Cultural heritage Encompasses past and present cultural associations of all people in Australia, including tradition, knowledge and customs. It can be tangible (i.e. have physical manifestations in the form of art, buildings etc.) or intangible (i.e. spiritual or social associations, songs, stories and cultural practices). Cultural significance includes values that are social, spiritual, aesthetic, historic and scientific. When natural resources acquire meaning for a particular group, they become cultural resources as well.

Ecologically sustainable use Using society's natural resources within the capacity of the species and ecosystems, so that the health, diversity and productivity of the environment and the ecological processes on which life depends are conserved and enhanced, and the quality of life, now and in the future, can be increased.

Fauna Any mammal, bird, reptile or amphibian. NPWS has responsibility for the conservation of fauna. Note this definition excludes fish or invertebrates.

Feral species A domesticated species that has become wild.

Fire Management Includes all activity associated with the use and control of fire in bushland designed to achieve stated objectives for the protection of life and property, and the maintenance of wildlife communities.

Fire Management Plan A plan of operations to prevent, detect and suppress unplanned fires and to reduce bushfire hazard, prepared by a Bushfire Management Committee, constituted under the RF Act for coordinated fire management and operations within a rural fire district.

Historic places Landscapes, sites buildings or other works together with pertinent contents and surroundings and include structures, ruins, archaeological sites and areas

Introduced species A species occurring in an area outside its historically known natural range as a result of intentional or accidental dispersal by human activities. Also known as exotic or alien species.

- Karst Terrain with special landforms and drainage characteristics on account of greater solubility of certain rocks in natural waters than is common.
- Policy A statement of attitude and courses of action, directed toward the attainment of NPWS corporate goals and/or objectives.
- Recovery plan A document, prepared under the *TSC Act*, that identifies the actions to be taken to promote the recovery of a threatened species, or endangered population or ecological community.
- Speleology The exploration, description and scientific study of caves and related phenomena.